

1 Claims 1-56 remain in the application for consideration and are listed
2 below:

3
4 1. (Original) In a computer graphic processing system in which a ray is
5 cast toward an object represented by a collection of pre-determined shapes each
6 characterized by characteristic data, a method for determining which of the shapes
7 are intersected by the ray, the method comprising:

8 defining a reference object relative to the represented object;
9 determining the positions of the shapes relative to the reference object
10 using the characteristic data; and

11 determining, on the basis of the positions of the shapes relative to the
12 reference object, those shapes that have no chance of intersecting the ray, and
13 those remaining shapes that may intersect the ray.

14
15 2. (Original) The method of claim 1 further comprising using a
16 predetermined algorithm to determine which one of those remaining shapes
17 intersects the ray.

18
19 3. (Original) The method of claim 1, wherein the collection of shapes
20 comprises at least one polygonal shape.

21
22 4. (Original) The method of claim 1, wherein the collection of shapes
23 comprises a plurality of polygonal shapes.

1 5. (Original) The method of claim 1, wherein the collection of shapes
2 comprises at least one triangle.

3
4 6. (Original) The method of claim 1, wherein the collection of shapes
5 comprises a plurality of triangles.

6
7 7. (Original) The method of claim 1, wherein the collection of shapes
8 comprises a triangle mesh.

9
10 8. (Original) The method of claim 1, wherein the collection of shapes
11 comprises a triangle strip.

12
13 9. (Original) The method of claim 1, wherein the collection of shapes
14 comprises a triangle fan.

15
16 10. (Original) The method of claim 1, wherein said reference object
17 comprises at least one plane.

18
19 11. (Original) The method of claim 1, wherein said reference object
20 comprises a plurality of planes each of which contain the ray.

21
22 12. (Original) The method of claim 1, wherein said determining the
23 positions of the shapes comprises determining positional aspects of sub-
24 components of individual ones of the shapes to provide the characteristic data.

1 13. (Original) The method of claim 12, wherein the individual shapes
2 comprise polygons and the sub-components comprise vertices that define the
3 polygons, said determining the positions of the shapes comprising computing the
4 positions of the vertices relative to the reference object.

5
6 14. (Original) The method of claim 13, wherein the reference object
7 comprises a plane.

8
9 15. (Original) The method of claim 14, wherein the plane is parallel to
10 one of the x, y, and z axes.

11
12 16. (Original) In a computer graphic processing system in which a ray is
13 cast toward an object represented by a collection of pre-determined shapes, a
14 method for determining which of the shapes are intersected by the ray, the method
15 comprising:

16 defining a collection of polygons that approximate an object, individual
17 polygons having a plurality of vertices;

18 casting a ray toward the approximated object;

19 defining a reference object relative to the collection of polygons and that
20 contains the cast ray;

21 pre-characterizing at least some vertices of at least some of the polygons to
22 provide characteristic data that describes the vertices' positions relative to the
23 reference object; and

24 using the characteristic data to ascertain the positions of the individual
25 polygons relative to the reference object.

1
2 17. (Original) The method of claim 16, wherein the collection of
3 polygons approximate the surface of the object.

4
5 18. (Original) The method of claim 16, wherein the individual polygons
6 have a similar geometry.

7
8 19. (Original) The method of claim 16, wherein the individual polygons
9 comprise triangles.

10
11 20. (Original) The method of claim 16, wherein the collection of
12 polygons has a plurality of faces and a plurality of vertices, said faces
13 outnumbering said vertices.

14
15 21. (Original) The method of claim 16, wherein at least two of said
16 polygons share at least one side.

17
18 22. (Original) The method of claim 16, wherein at least two of said
19 polygons share at least one vertex.

20
21 23. (Original) The method of claim 16, wherein none of said polygons
22 share a vertex.

23
24 24. (Previously Presented) In a computer graphic processing system in
25 which a ray is cast toward an object represented by a collection of pre-determined

1 shapes, a method for determining which of the shapes are intersected by the ray,
2 the method comprising:

3 defining a collection of polygons that approximate an object, individual
4 polygons having a plurality of vertices;

5 casting a ray toward the approximated object;

6 defining a reference object relative to the collection of polygons and that
7 contains the cast ray;

8 pre-characterizing at least some vertices of at least some of the polygons to
9 provide characteristic data that describes the vertices' positions relative to the
10 reference object; and

11 using the characteristic data to ascertain the positions of the individual
12 polygons relative to the reference object, wherein said using of the characteristic
13 data comprises determining whether an individual polygon is in a sub-set of
14 polygons that might be intersected by the ray.

15
16 25. (Previously Presented) In a computer graphic processing system in
17 which a ray is cast toward an object represented by a collection of pre-determined
18 shapes, a method for determining which of the shapes are intersected by the ray,
19 the method comprising:

20 defining a collection of polygons that approximate an object, individual
21 polygons having a plurality of vertices;

22 casting a ray toward the approximated object;

23 defining a reference object relative to the collection of polygons and that
24 contains the cast ray;

1 pre-characterizing at least some vertices of at least some of the polygons to
2 provide characteristic data that describes the vertices' positions relative to the
3 reference object; and

4 using the characteristic data to ascertain the positions of the individual
5 polygons relative to the reference object, wherein said using of the characteristic
6 data comprises determining whether an individual polygon is in a sub-set of
7 polygons at least some of which straddle the reference object.

8

9 26. (Previously Presented) In a computer graphic processing system in
10 which a ray is cast toward an object represented by a collection of pre-determined
11 shapes, a method for determining which of the shapes are intersected by the ray,
12 the method comprising:

13 defining a collection of polygons that approximate an object, individual
14 polygons having a plurality of vertices;

15 casting a ray toward the approximated object;

16 defining a reference object relative to the collection of polygons and that
17 contains the cast ray;

18 pre-characterizing at least some vertices of at least some of the polygons to
19 provide characteristic data that describes the vertices' positions relative to the
20 reference object;

21 using the characteristic data to ascertain the positions of the individual
22 polygons relative to the reference object, wherein said using of the characteristic
23 data comprises determining whether an individual polygon is in a sub-set of
24 polygons at least some of which straddle the reference object; and

evaluating the sub-set of polygons to determine which polygons are intersected by the ray.

27. (Original) In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined shapes, a method for determining which of the shapes are intersected by the ray, the method comprising:

defining a plurality of triangles that approximate an object, individual triangles having three vertices;

casting a ray toward the approximated object;

defining at least one plane relative to the approximated object to contain the ray;

pre-characterizing the vertices of the plurality of triangles to provide characteristic data that describes the positions of the vertices relative to said at least one plane; and

using the characteristic data to ascertain the positions of the individual triangles relative to said at least one plane.

28. (Original) The method of claim 27, wherein said defining of said plurality of triangles comprises defining a triangle mesh.

29. (Original) The method of claim 27, wherein said defining of said plurality of triangles comprises defining a triangle fan.

1 30. (Original) The method of claim 27, wherein said defining of said
2 plurality of triangles comprises defining a triangle strip.

3
4 31. (Previously Presented) In a computer graphic processing system in
5 which a ray is cast toward an object represented by a collection of pre-determined
6 shapes, a method for determining which of the shapes are intersected by the ray,
7 the method comprising:

8 defining a plurality of triangles that approximate an object, individual
9 triangles having three vertices;

10 casting a ray toward the approximated object;

11 defining at least one plane relative to the approximated object to contain the
12 ray;

13 pre-characterizing the vertices of the plurality of triangles to provide
14 characteristic data that describes the positions of the vertices relative to said at
15 least one plane; and

16 using the characteristic data to ascertain the positions of the individual
17 triangles relative to said at least one plane, wherein said using of the characteristic
18 data comprises determining whether a particular individual triangle has a chance
19 of being intersected by the ray.

20
21 32. (Previously Presented) In a computer graphic processing system in
22 which a ray is cast toward an object represented by a collection of pre-determined
23 shapes, a method for determining which of the shapes are intersected by the ray,
24 the method comprising:

1 defining a plurality of triangles that approximate an object, individual
2 triangles having three vertices;

3 casting a ray toward the approximated object;

4 defining at least one plane relative to the approximated object to contain the
5 ray;

6 pre-characterizing the vertices of the plurality of triangles to provide
7 characteristic data that describes the positions of the vertices relative to said at
8 least one plane; and

9 using the characteristic data to ascertain the positions of the individual
10 triangles relative to said at least one plane, wherein said using of the characteristic
11 data comprises determining whether a particular individual triangle straddles said
12 at least one plane.

13
14 33. (Previously Presented) In a computer graphic processing system in
15 which a ray is cast toward an object represented by a collection of pre-determined
16 shapes, a method for determining which of the shapes are intersected by the ray,
17 the method comprising:

18 defining a plurality of triangles that approximate an object, individual
19 triangles having three vertices;

20 casting a ray toward the approximated object;

21 defining at least one plane relative to the approximated object to contain the
22 ray;

23 pre-characterizing the vertices of the plurality of triangles to provide
24 characteristic data that describes the positions of the vertices relative to said at
25 least one plane;

1 using the characteristic data to ascertain the positions of the individual
2 triangles relative to said at least one plane, wherein said using of the characteristic
3 data comprises defining a sub-set of triangles at least some of which straddle the
4 plane; and

5 evaluating the sub-set of triangles to ascertain which triangles are
6 intersected by the ray.

7
8 34. (Original) The method of claim 27, wherein none of the triangles
9 share any vertices.

10
11 35. (Original) The method of claim 27, wherein all of the triangles share
12 at least one vertex with another of the triangles.

13
14 36. (Original) The method of claim 27, wherein said defining of said at
15 least one plane comprises defining a plane to be parallel to one of the x, y, or z
16 axes.

17
18 37. (Original) In a computer graphic processing system in which a ray is
19 cast toward an object represented by a collection of pre-determined polygons, a
20 method for determining which of the polygons are intersected by the ray, the
21 method comprising:

22 defining a sub-set of polygons from a collection of polygons that
23 approximate an object by determining which polygons have vertices that satisfy a
24 predefined relationship relative to a reference object; and

evaluating the sub-set of polygons to ascertain which of the polygons is intersected by a cast ray.

38. (Original) The method of claim 37, wherein the reference object comprises a plane.

39. (Original) The method of claim 37, wherein the reference object comprises multiple planes.

40. (Previously Presented) In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined polygons, a method for determining which of the polygons are intersected by the ray, the method comprising:

defining a sub-set of polygons from a collection of polygons that approximate an object by determining which polygons have vertices that satisfy a predefined relationship relative to a reference object, wherein the reference object comprises a plane; and

evaluating the sub-set of polygons to ascertain which of the polygons is intersected by a cast ray,

wherein said determining comprises determining which polygons straddle the plane.

41. (Original) One or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, implement the method of claim 37.

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2 42. (Original) A programmable computer having a memory and a
3 processor, the memory containing software code which causes the processor to
4 execute the method of claim 37.

5

6 43. (Original) A computer graphic processing system comprising a
7 programmable computer programmed with computer-readable instructions which,
8 when executed by the programmable computer, implement the following method:

9 defining a plurality of polygons that approximate an object, individual
10 polygons having a plurality of vertices;

11 casting a ray toward the approximated object;

12 defining at least one plane relative to the approximated object to contain the
13 ray;

14 pre-characterizing the vertices of the plurality of polygons to provide
15 characteristic data that describes the positions of the vertices relative to said at
16 least one plane;

17 using the characteristic data to ascertain the positions of the individual
18 polygons relative to said at least one plane;

19 determining which of the individual polygons might be intersected by the
20 ray, based upon their ascertained positions, to provide a sub-set of polygons; and

21 evaluating the sub-set of polygons to ascertain which of the polygons are
22 intersected by the ray.

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1 44. (Original) The computer graphic processing system of claim 43,
2 wherein said defining of the plurality of polygons comprises defining a polygon
3 mesh.

4
5 45. (Original) The computer graphic processing system of claim 43,
6 wherein said defining of the plurality of polygons comprises defining a polygon
7 fan.

8
9 46. (Original) The computer graphic processing system of claim 43,
10 wherein said defining of the plurality of polygons comprises defining a polygon
11 strip.

12
13 47. (Original) The computer graphic processing system of claim 43,
14 wherein said defining of said at least one plane comprises defining said plane to be
15 parallel to one of the x, y, and z axes.

16
17 48. (Original) One or more computer-readable media having computer-
18 readable instructions thereon which, when executed by a computer graphic
19 processing system, implement the following method:

20 defining a plurality of triangles that approximate an object, individual
21 triangles having three vertices;

22 casting a ray toward the approximated object;

23 defining at least one plane relative to the approximated object to contain the
24 ray;

1 pre-characterizing the vertices of the plurality of triangles to provide
2 characteristic data that describes the positions of the vertices relative to said at
3 least one plane;

4 using the characteristic data to ascertain the positions of the individual
5 triangles relative to said at least one plane;

6 determining which of the individual triangles might be intersected by the
7 ray, based upon their ascertained positions, to provide a sub-set of triangles; and

8 evaluating the sub-set of triangles to ascertain which of the triangles are
9 intersected by the ray.

10
11 49. (Original) The one or more computer-readable media of claim 48,
12 wherein said defining of the plurality of triangles comprises defining one of a
13 triangle mesh, a triangle strip, and a triangle fan.

14
15 50. (Original) A computer graphic processing system comprising:
16 a processor;
17 memory; and
18 software code stored in the memory that causes the processor to implement
19 a ray-intersection algorithm which:

20 casts a ray at a collection of shapes that approximate an object;
21 defines a reference object that contains the ray;
22 pre-characterizes aspects of individual ones of the shapes of the collection
23 to provide characteristic data; and
24 uses the characteristic data to ascertain the position of the shapes of the
25 collection of shapes relative to the reference object.

1

2 51. (Original) The computer graphic processing system of claim 50,
3 wherein the ray intersection algorithm casts a ray at a collection of polygons, each
4 of which have similar geometries.

5

6 52. (Original) The computer graphic processing system of claim 50,
7 wherein the ray intersection algorithm casts a ray at a collection of triangles.

8

9 53. (Original) The computer graphic processing system of claim 52,
10 wherein the collection of triangles defines a triangle mesh.

11

12 54. (Original) The computer graphic processing system of claim 50,
13 wherein the ray intersection algorithm pre-characterizes aspects of the shapes by
14 computing positions of various sub-components of the shapes relative to the
15 reference object.

16

17 55. (Original) The computer graphic processing system of claim 54,
18 wherein the reference object comprises at least one plane.

19

20 56. (Original) The computer graphic processing system of claim 55,
21 wherein the shapes comprise polygons and the sub-components comprise vertices
22 of the polygons.

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